

WHAT IS CLAIMED IS:

1 1. A VLAN tagging unit having multiple logical interfaces, different logical
2 interfaces on the VLAN tagging unit being associated with different customer
3 networks, the customer networks transmitting data to the VLAN tagging unit
4 across a WAN, the VLAN tagging unit producing a VLAN ID for data associated
5 with a customer network, the production of the VLAN ID depending at least
6 partially on the logical interface of the VLAN tagging unit on which the data is
7 received, the VLAN tagging unit using the VLAN ID to produce VLAN frames to
8 sent to additional network elements.

1 2. The VLAN tagging unit of Claim 1 wherein one logical interface
2 comprises a physical port.

1 3. The VLAN tagging unit of Claim 2 wherein one logical interface
2 comprises a T1 port.

1 4. The VLAN tagging unit of claim 1, wherein one logical interface
2 comprises a DS3, CT3 or E1 port.

1 5. The VLAN tagging unit of Claim 2 wherein at least one logical
2 interface comprises an Ethernet port.

1 6. The VLAN tagging unit of Claim 1 wherein at least one logical
2 interface comprises a portion of a physical port.

1 7. The VLAN tagging unit of Claim 6 wherein the portion of the
2 physical port comprises a fractional T1.

1 8. The VLAN tagging unit of Claim 1 wherein a logical information
2 comprises a multi link combination of multiple ports.

1 9. The VLAN tagging unit of Claim 8 wherein the multilink
2 combination of ports is a multilink combination of T1 ports.

1 10. The VLAN tagging unit of Claim 1 wherein at least logical
2 interface comprises an virtual circuit.

1 11. The VLAN tagging unit of Claim 1 wherein at least one logical
2 interface comprises an aggregated virtual circuit.

1 12. The VLAN tagging unit of Claim 1 wherein the customer
2 networks are not associated into VLAN IDs.

1 13. The VLAN tagging unit of Claim 1 wherein the customer
2 networks are associated into VLANs using VLAN IDs.

1 14. The VLAN tagging unit of Claim 13 wherein another VLAN
2 tagging unit is used to strip the VLAN header from packets before sending it to the
3 first VLAN tagging unit.

1 15. The system of Claim 1 wherein the VLAN ID depends upon other
2 information such that multiple VLAN IDs can be used for data received at the same
3 logical interface.

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1 16. The VLAN tagging unit of Claim 1 wherein only the logical
2 interface is used to determine the tagged VLAN ID.

1 17. The VLAN tagging unit of Claim 1 further includes a VLAN table
2 associating VLAN IDs and associated logical interfaces.

1 18. The system of Claim 1 wherein when data associated with a
2 VLAN ID is received it is forwarded to each of the associated logical interfaces
3 other than the logical interface on which the data is received.

1 19. The VLAN tagging unit of Claim 1 wherein service parameters
2 are further associated with the VLAN IDs, the service parameter affecting data
3 passing through the VLAN tagging unit.

1 20. The VLAN tagging unit of Claim 1 wherein data from multiple
2 VLAN having different VLAN IDs are sent across the same WAN connection,
3 with a quality of service indication determining how the bandwidth is divided
4 between the VLANs, the quality of service indication associated with a VLAN ID.

1 21. The VLAN tagging unit of Claim 1 further comprising network
2 address translation for IP addresses based on VLAN ID.

1 22. The VLAN tagging unit of Claim 1 wherein at least one VLAN
2 ID is a management ID that allows the management of network elements such that
3 elements associated with other VLAN IDs cannot access the management function.

1 23. The VLAN tagging unit of Claim 1 wherein the VLAN tagging
2 unit is adapted to associate flows coming to the unit into separate VLAN IDs such
3 that elements in at least one network portion can handle the flows differently.

1 24. The VLAN tagging unit of Claim 1 wherein the VLAN tagging
2 unit has a VLAN table of VLAN IDs and associated logical interfaces, the VLAN
3 table being dynamically updated during operation of the VLAN tagging unit.

1 25. A VLAN tagging unit having multiple logical interfaces, different
2 logical interfaces on the VLAN tagging unit being associated with different
3 customer networks, the customer networks transmitting data to the VLAN tagging
4 unit across a WAN, the VLAN tagging unit producing a VLAN ID for data
5 associated with a customer network, the production of the VLAN ID depending at
6 least partially on the logical interface of the VLAN tagging unit on which the data
7 is received, the VLAN ID further depending upon other information such that
8 multiple VLAN IDs can be used for data received at the same logical interface, the
9 VLAN tagging unit using the VLAN ID to produce VLAN frames to sent to
10 additional network elements.

1 26. The VLAN tagging unit of Claim 25 wherein at least one logical
2 interface comprises a multi-link of T1s.

1 27. The VLAN tagging unit of Claim 25 wherein in at least one
2 logical interface comprises an Ethernet port.

1 28. The VLAN tagging unit of Claim 25 wherein at least one logical
2 interface comprises a T1 port.

3 29. The VLAN tagging unit of claim 25, wherein at least one logical
4 interface comprises a DS3, CT3 or E1 port.

1 30. The VLAN tagging unit of Claim 25 wherein the customer
2 networks are not associated into VLANs.

1 31. The VLAN tagging unit of Claim 25 wherein the customer
2 networks are associated into VLANs having VLAN IDs.

1 32. The VLAN tagging unit of Claim 31 wherein another VLAN
2 tagging unit strips the VLAN header from the data from the customer network
3 before transmitting the data from the another VLAN tagging unit to the first VLAN
4 tagging unit.

1 33. The VLAN tagging unit of Claim 25 wherein the VLAN tagging
2 unit has a VLAN table associating VLAN IDs with logical interfaces and other
3 information.

1 34. The VLAN tagging unit of Claim 25 wherein service parameters
2 are associated with VLAN IDs and the units are adapted to use the service
3 parameter to affect data passing through the unit based upon the VLAN IDs.

1 35. The VLAN tagging unit of Claim 25 wherein the quality of
2 service is determined based upon the VLAN IDs.

1 36. The VLAN tagging unit of Claim 25 wherein the VLAN tagging
2 unit further does network address translation based on VLAN IDs.

1 37. The VLAN tagging unit of Claim 25 wherein at least one VLAN
2 ID is used for management.

1 38. The VLAN tagging unit of Claim 25 wherein the VLAN tagging
2 unit is adapted to associate flows coming through the Internet with separate VLAN
3 IDs such that the elements in at least one network portion can handle the flows
4 differently.

1 39. The VLAN tagging unit of Claim 25 wherein the VLAN tagging
2 unit has a VLAN table of VLAN IDs and associated logical interfaces, and the
3 VLAN table is dynamically updated during the operation of the unit.

1 40. A system comprising:
2 a customer network using a first VLAN ID;
3 a first VLAN tagging unit, the first VLAN tagging unit adapted to convert
4 VLAN frames into data in a format without a VLAN ID which is sent across a
5 WAN to a second VLAN tagging unit; and
6 the second VLAN tagging unit adapted to receive data in the format without
7 a VLAN ID, the second VLAN tagging unit converting the data in the format
8 without a VLAN ID into VLAN frames with a second VLAN ID, wherein the first
9 and second VLAN ID need not be the same.

1 41. The system of Claim 40 wherein data is sent between the first and
2 second VLAN tagging unit as datalink layer encapsulated IP packet.

1 42. The system of Claim 41 wherein the data link connection is a
2 point to point protocol packet.

1 43. The system of Claim 41 wherein the packet is a multi-link point to
2 point protocol packet.

1 44. The system of Claim 40 wherein the second VLAN tagging unit
2 uses the logical interface from which the data is received in order to determine
3 what second VLAN ID to associate with the data.

1 45. The system of Claim 44 wherein the second VLAN tagging unit
2 includes a VLAN table with VLAN IDs associated with logical interfaces.

1 46. The system of Claim 40 wherein IP multiplexing is done such that
2 the first and second VLAN tagging units associate spoof MAC addresses with
3 WAN connections and wherein the spoof MAC addresses are provided to units on
4 LAN connections to the first and second tagging units.

1 47. The system of Claim 40 wherein both the first and second VLAN
2 tagging unit uses VLAN tables that associate VLAN IDs with logical interfaces.

1 48. The system of Claim 40 wherein the first and second VLAN
2 tagging units use service parameters which affect the data transferred over the
3 WAN.

1 49. The system of Claim 40 wherein the first and second tagging unit
2 use a quality of service connections to distinguish between different VLAN
3 connections.

1 50. The system of Claim 40 wherein the first and second VLAN
2 tagging units use network address translation based upon VLAN IDs.

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1 51. The system of Claim 40 wherein the first and second VLAN
2 tagging units use certain VLAN IDs for management.

1 52. The system of Claim 40 wherein the selection of VLAN IDs is
2 used based upon a flow-based management system.

3 53. The system of Claim 40 wherein the first and second VLAN
4 tagging units use VLAN tables associating VLAN IDs and logical interfaces, the
5 VLAN table being dynamically updated.

1 54. A unit associated with customer networks and with at least one
2 WAN, wherein the customer networks are associated with different logical
3 interfaces on the unit, the unit allowing transfer of data associated with a VLAN
4 across the WAN, the unit maintaining a table of VLAN IDs and associated logical
5 interfaces such that when data associated with a VLAN ID is received it can be
6 forwarded to each of the associated logical interfaces other than the logical
7 interface on which the data is received.

1 55. The unit of Claim 54 wherein the logical interfaces include at least
2 one multi-link T1.

1 56. The unit of Claim 54 wherein the logical interfaces include at least
2 one T1 port.

 57. The unit of claim 54 wherein at least one logical interface
comprises a DS3, CT3 or E1 port.

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6 parameter, wherein based at least partially on the VLAN ID the unit is adapted to
7 use the service parameter to affect data passing through the unit.

1 66. The unit of Claim 65 wherein the service parameter comprises a
2 quality of service parameter.

1 67. The unit of Claim 65 wherein the service parameter indicates a
2 translation.

1 68. The unit of Claim 65 wherein the service parameter indicates a
2 compression.

1 69. The unit of Claim 65 wherein the service parameter indicates an
2 encapsulation.

1 70. The unit of Claim 65 wherein the service parameter indicates an
2 encryption.

1 71. The unit of Claim 65 wherein the logical interfaces in one
2 embodiment includes a multi-link of multiple T1s.

1 72. The unit of Claim 65 wherein network address translation is done
2 based upon the VLAN ID.

1 73. The unit of Claim 65 wherein one VLAN ID is maintained for
2 management.

1 74. The unit of Claim 65 wherein flows coming to the unit are tagged
2 with different VLAN IDs so that VLAN elements can handle flows differently.

1 75. The unit of Claim 65 wherein the VLAN table is dynamically
2 updated.

1 76. A unit associated with at least one WAN, different logical
2 interfaces on the unit being associated with different customer networks, the unit
3 allowing transfer of data associated with a VLAN across the WAN, the unit
4 maintaining a table of VLAN IDs and at least one associated quality of service
5 indication, wherein data from multiple VLANs having different VLAN IDs are
6 sent across the same WAN connection with the quality of service indication
7 determining how bandwidth is divided between the VLANs.

1 77. The unit of Claim 76 wherein the quality of service indications
2 includes a committed information rate indication.

1 78. The unit of Claim 77 wherein the quality of service indication
2 further includes a burst rate indication.

1 79. The unit of Claim 76 wherein the quality of service indication
2 further includes a shape indication.

1 80. The system of Claim 76 wherein the unit further includes a
2 policing indication to indicate how the unit policies the quality of service allocated
3 to a VLAN.

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1 81. The unit of Claim 76 wherein the unit prioritizes data sent based
2 upon the VLAN ID.

1 82. A unit associated with customer networks and with at least one
2 WAN, different logical interfaces on the unit being associated with different
3 customer networks, the unit maintaining a table of VLAN IDs and associated
4 logical interfaces, the VLAN Table also containing IP addresses associated with the
5 different logical interfaces such that network address translation of IP addresses is
6 done at least in part due to the logical interface on the unit from which data is
7 received.

1 83. The unit of Claim 82 wherein the unit data transmits data from the
2 unit to the WAN and the unit strips away the VLAN ID and transmits non-VLAN
3 ID data to another unit across the WAN.

1 84. The unit of Claim 82 wherein the network address translation
2 comprises IP Version 4 to IP Version 6 address translation.

1 85. A network including at least one network portion including
2 elements supporting VLANs, the at least one network portion including an unit
3 operably connected to a WAN, the unit including a VLAN table associating VLAN
4 IDs and logical interfaces of the unit, wherein the unit receives data from the WAN
5 and converts the data to a VLAN frame format including VLAN IDs, wherein at
6 least one VLAN ID is a management ID that allows the management of network
7 elements such that elements associated with other VLAN IDs cannot access the
8 management functions.

1 86. The network of Claim 85 wherein connectivity is checked based
2 upon the VLAN ID.

1 87. The network of Claim 85 wherein the unit converts non-VLAN
2 management instructions to VLAN ID-based management instructions.

1 88. A network including at least one network portion including
2 elements supporting VLANs, the at least one network portion including an unit
3 operably connected to a WAN, the unit including a VLAN table associating VLAN
4 IDs and logical interfaces of the unit, wherein the unit receives data from the WAN
5 and converts the data to a VLAN frame format including VLAN IDs, wherein the
6 unit is adapted to associate flows coming to the unit with separate VLAN IDs such
7 that elements in the at least one network portion can handle the flows differently.

1 89. The network of Claim 88 wherein the association of flows is done
2 based upon a group.

1 90. The network of Claim 88 wherein which the flows are tagged
2 based upon TCP port.

1 91. The system of Claim 88 wherein the flows are tagged based upon
2 UDP port.

1 92. The system of Claim 88 wherein the flows are tagged based upon
2 designation IP address.

1 93. The system of Claim 88 in which the flows are tagged based upon
2 source IP address.

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1 94. The system of Claim 88 in which different quality of services are
2 provided for different VLAN IDs.

1 95. The system of Claim 88 in which other network elements send
2 different flows to different locations.

1 96. The system of Claim 95 in which web traffic is sent to a web
2 cache unit.

1 97. An unit associated with at least one WAN, different logical
2 interfaces on the unit being associated with different customer networks, the unit
3 allowing transfer of data associated with a VLAN across a WAN, the unit
4 maintaining a VLAN table of VLAN IDs and logical interfaces associated with
5 each VLAN ID, wherein the VLAN table is dynamically updated during operation
6 of the unit.

1 98. The unit of Claim 97 in which the VLAN table is dynamically
2 updated by examining VLAN IDs and logical interfaces of incoming data.

1 99. The system of Claim 97 in which the unit broadcasts test message
2 across logical interfaces in order to receive data to associate VLAN IDs and logical
3 interfaces.

1 100. The system of Claim 97 in which VLAN table data is dynamically
2 obtained from other units having VLAN tables.